Using an Office-Based, Dedicated Extremity MRI Scanner for Depicting Important Structures in Common Wrist Pathologies: A Pilot Comparison with a Conventional MRI Scanner

Qi Yin, MD, MSc[1,2] Radu A. Manoliu, MD, PhD[3] Jayant R. Kichari, MD[2] Marco J. P. F. Ritt, MD, PhD[1,4]

[1] Department of Plastic, Reconstructive, and Hand Surgery, Amsterdam University Medical Center, Amsterdam, The Netherlands
[2] Department of Radiology, St. Jansdal Hospital, Harderwijk, The Netherlands
[3] MRI Center Amsterdam, Amsterdam, The Netherlands
[4] The Hand Clinic Amsterdam, Amsterdam, TheNetherlands

Address for correspondence Qi Yin, MD, MSc, Department of Plastic, Reconstructive, and Hand Surgery, Amsterdam University Medical Center, De Boelelaan 1117, 1081 HV Amsterdam, The Netherlands (e-mail: Q.Yin@amsterdamumc.nl).

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Abstract

Background Compared with the conventional magnetic resonance imaging (MRI), dedicated MRI scanners are more accessible. Images of a dedicated 1.0-T MRI specifically developed for the hand and wrist were compared with images of a conventional 1.5-T MRI.
Methods Paired images of the right wrist were randomized and separately graded by two experienced radiologists for the quality of anatomical details, including the triangular fibrocartilage complex, carpal ligaments, intercarpal cartilage, median and ulnar nerves, overall image quality, and artifacts. Interrater reliability was measured with the percentage of exact agreement and agreement within a range of ± 1 score point. Participant experience of undergoing the examination in both MRI scanners was evaluated using a questionnaire.
Results The overall image quality of all sequences was considered to be moderate to high. In 25 of 38 paired images, no statistically significant difference was found between the MRI scanners. Ten scores were found to be in favor of the dedicated extremity MRI. Within a range of ± 1 score point, the extremity MRI and the conventional MRI demonstrated an interrater agreement of 67 to 100% and 70 to 100%, respectively. Among the respondents of the questionnaire, the extremity MRI scored better for participant satisfaction when compared with the conventional MRI.
Conclusions In healthy volunteers, the dedicated extremity MRI generally is similar or superior to the conventional MRI in the depiction of anatomical structures of the wrists, image quality, and artifacts, and significantly scored better on participant satisfaction. Future clinical studies should focus on defining the diagnostic value of the extremity MRI in wrist pathologies.

Keywords
- ► Magnetic Resonance Imaging
- ► wrist
- ► hand
- ► extremity
- ► anatomy

Magnetic resonance imaging (MRI) is a powerful diagnostic modality for many wrist pathologies. Absolute and relative contraindications may limit the accessibility of this examination in the conventional tunnel units for a considerable group of patients.[1] Dedicated extremity MRIs are known for their nonclaustrophobic element, low noise level, and comfortable patient positioning, which make them more accessible to patients. Moreover, their compact size, simple

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operation, and affordability make them more accessible to (private) clinics and hospitals.

Most dedicated MRI scanners on the current market operate at less than 1.0-T. The WristView MRI (Aspect Imaging) is a dedicated MRI that was developed for examination of the wrist and hand. This MRI scanner operates at a strength of 1.0-T and uses a *permanent* magnet. Different from superconducting magnets used in most MRI scanners, permanent magnets do not need a cooling system, resulting in lower costs and higher accessibility. Therefore, the WristView MRI scanner seems to be a good alternative to the conventional MRI for diagnosing wrist and hand pathologies, especially in an office-based setting. However, the clinical validity of the dedicated extremity MRI is not yet proven in terms of image quality and therefore diagnostic reliability.

The purpose of our pilot study was to explore the value of the WristView MRI by comparing images of the wrist obtained with this extremity scanner with images obtained with a conventional MRI scanner in healthy volunteers using similar scan parameters. Comparison was focused on important wrist structures in common wrist pathologies, including the triangular fibrocartilage complex (TFCC), scapholunate (SL) ligament, lunotriquetral (LT) ligament, intercarpal cartilage, and the median and ulnar nerves. In addition, the overall image quality, artifacts, and participant experience in undergoing the examination in both MRI scanners were compared.

Materials and Methods

The study was approved by the Institutional Review Board of the Amsterdam University Medical Center,and informed consent from the participating healthy volunteers was obtained. Imaging protocol at both field strengths included a T2 short tau inversion recovery (STIR) axial sequence, a proton density (PD) STIR axial sequence, a PD STIR sagittal sequence, a PD coronal sequence, a PD STIR coronal sequence, and a T2 STIR coronal sequence (►**Table 1**). The geometrical parameters were kept similar, whereas contrast parameters were adjusted for both

Table 1 Scan protocol

	1.0-T Wrist View MRI	1.5-T MRI
T2 STIR axial		
Pixel size (mm x mm)	0.36 × 0.44	0.4 × 0.4
Slice thickness (mm)	3	3
Slice gap (mm)	0.3	0.3
Number of slices	19	19
TR/TE/TI (ms)	5,000/52.83/90	5,490/56.0/145
FOV (mm)	120 × 80	120 × 82.5
Scan time (minutes:seconds)	5:25	2.57
PD STIR axial		
Pixel size (mm x mm)	0.36 × 0.44	0.4 × 0.4
Slice thickness (mm)	3	3
Slice gap (mm)	0.3	0.3
Number of slices	19	19
TR/TE/TI (ms)	3,850/23.28/85	5,490/28.0/145
FOV (mm)	120 × 80	120 × 82.5
Scan time (minutes:seconds)	5:42	3:52
PD STIR sagittal		
Pixel size (mm x mm)	0.5 × 0.4	0.4 × 0.4
Slice thickness (mm)	3	3
Slice gap (mm)	0.3	0.3
Number of slices	22	22
TR/TE/TI (ms)	4,800/11.91/90	5,980/14/145
FOV (mm)	80 × 110	110 × 79.1
Scan time (minutes:seconds)	3:55	4:55
PD coronal		
Pixel size (mm x mm)	0.36 × 0.27	0.3 × 0.3
Slice thickness (mm)	2.5	2.5
Slice gap (mm)	0.25	0.3
Number of slices	19	19
TR/TE (ms)	3,000/13.5	3,000/14.0
FOV (mm)	120 × 110 mm	120 × 112.5
Scan time (minutes:seconds)	5:15	5:32
PD STIR coronal		
Pixel size (mm x mm)	0.41 × 0.37	0.4 × 0.4
Slice thickness (mm)	3	3
Slice gap (mm)	0.3	0.3
Number of slices	18	18
TR/TE/TI (ms)	3,600/11.58/85	4,940/14/145
FOV (mm)	120 × 110	120 × 108.8
Scan time (minutes:seconds)	5:34	4.18
T2 STIR coronal		
Pixel size (mm x mm)	0.39 × 0.36	0.4 × 0.4
Slice thickness (mm)	3	3
Slice gap (mm)	0.3	0.3
Number of slices	18	18
TR/TE/TI (ms)	4,600/57.47/90	4,940/56.0/145
FOV (mm)	120 × 110	120 × 108.8
Scan time (minutes:seconds)	4:59	3.29

Abbreviations: FOV, field of view; MRI, magnetic resonance imaging; PD, proton density; STIR, short tau inversion recovery; TE, echo time; TI, inversion time; TR, repetition time.

scanners to get the best images possible. Ten healthy adult volunteers were included in this pilot study. Exclusion criteria were evident wrist complaints and/or fractures, wrist surgery in the past, and all relative and absolute contraindications of a conventional MRI, including having a pacemaker, metal implants of any kind, and claustrophobia. Images of the right wrist were acquired with a 1.0-T WristView MRI system and a 1.5-T Siemens Avanto MRI system (Siemens Healthcare GmbH) using the small flex coil in the latter. The interval between the scans was kept as small as possible. On condition that the participant did not report any trauma or experienced changes, the duration of 10 days between both scans was considered to be fair, assuming that no significant changes in the anatomy would take place within that short period of time. Images were separately evaluated by two radiologists with 30 and 7 years of experience in musculoskeletal radiology. Paired images were randomized and graded for the visibility of anatomical details, including the TFCC (central disc, meniscus homolog, and ulnar attachment), carpal ligaments (SL and LT ligament), intercarpal cartilage, and median and ulnar nerves. Blinding was not attempted due to the evident differences between the images of both MRI scanners, but neither was the provenience explicitly disclosed.

The adapted scoring system was based on scoring systems commonly used in comparative studies performed in the past on the anatomical structures of the wrist.[2–4] Two hand surgeons were independently asked to evaluate clarity of the chosen scoring systems and identify potential problems. For anatomical structures, a 4-point scoring system was used: 1, structure is not visible; 2, structure is visible but not able to be analyzed; 3, structure is visible and can be analyzed; and 4, structure is excellently visible, with sharp outlines. The radiologists evaluated the overall image quality using a 5-point scale: 1, low signal-to-noise ratio (SNR), trabecular structure, and articular cartilage are not clearly definable, 2, low-to-moderate SNR, trabecular structure *or* articular cartilage is not clearly definable, 3, moderate SNR, trabecular structure is poorly visible, articular cartilage is definable, but the two parts (proximal and distal) are not distinguishable; 4, moderate-to-high SNR, trabecular structure and the articular cartilage are well visible, but the margin between bone and cartilage or the intercartilage gap is not clearly definable; and 5, high SNR, trabecular structure is excellently visible, with clear margins between the bone and cartilage, the cartilage parts are clearly definable, and the intercartilage gap is visible (with or without synovial fluid). Artifacts were compared using a 4-point scoring system: 1, several artifacts; 2, moderate artifacts; 3, mild artifacts; 4, no artifacts.

Mean values and standard deviations of evaluation results were calculated for each sequence. Statistical analysis was performed using SPSS (IBM Corp.). Comparison between the median values of both MRI scanners was performed using the Wilcoxon signed-rank test. Statistical significance was set at $p < 0.05$. Interrater reliability was measured with the percentage of exact agreement and agreement within a range of ± 1 score point.[5] The total scan time for both examinations was noted. To evaluate the experience of the participants in undergoing the examination in both MRI scanners, a short questionnaire was distributed. One participant was excluded from this questionnaire considering potential conflict of interest. In the first part of this questionnaire, the participants assigned scores to their experience of claustrophobia, noise level, positioning comfort, duration, and general experience in both MRI scanners using a 5-point scoring system: 1, very bad; 5, very good. The second part involved a short case scenario in which a choice had to be made between the two MRI scanners. Finally, the respondent arranged a list of factors that one may find important when undergoing an MRI scan, from most important to least important.

Results

The mean scores of the visibility of anatomical details are presented in ►**Table 2**. The overall image quality of all sequences was considered to be moderate to high. Examples of anatomical structures produced by both MRI scanners are presented in ►**Figs. 1** to **5**. The best images were selected. All figures present the right wrist. The PD coronal sequence appeared to be the most optimal sequence on which structures were best visible and able to be analyzed, including the TFCC with the central disc, meniscus homolog, ulnar attachment, the carpal ligaments (SL and LT), and intercarpal cartilage. The median and ulnar nerves were best analyzed on the axial sequences. However, where the median nerve in most cases could be analyzed, the ulnar nerve was more often only visible but could not be analyzed. In 25 of 38 paired images, no statistically significant difference was found between the two MRI scanners. Among the scores of the 13 paired images that were significantly different, three were found to be in favor of the conventional MRI, including the intercarpal cartilage (3.7 vs. 3.2; $p = 0.02$), overall image quality (4.7 vs. 4.4; $p = 0.020$), and artifacts (4.0 vs 3.8; $p = 0.046$), on the PD coronal sequence. Ten scores were found to be in favor of the dedicated extremity MRI, including the median nerve on the T2 STIR axial sequence (3.4 vs. 3.2; $p = 0.034$), the median (3.6 vs. 3.2; $p = 0.007$) and ulnar (2.7 vs. 2.3; $p = 0.007$) nerves on the PD STIR axial sequence, the SL ligament (3.0 vs. 2.5; $p = 0.005$), LT ligament (2.8 vs. 2.1; $p = 0.003$), and intercarpal cartilage (2.3 vs. 1.9; $p = 0.01$) on the PD STIR coronal sequence, and the central disc (2.9 vs. 2.4; $p = 0.01$) and ulnar attachment of the TFCC (3.7 vs. 3.0; $p = 0.03$) on the T2 STIR coronal sequence (►**Table 2**). The results of interrater agreement for each evaluation are shown in ►**Table 3**. Within a range of ± 1 score point, the dedicated extremity MRI and the conventional MRI demonstrated an interrater agreement of 67 to 100% and 70 to 100%, respectively. The total scan time excluding preparation time was approximately 43 minutes for the dedicated extremity MRI and 25 minutes for the conventional MRI.

Among the respondents of the questionnaire, the dedicated extremity MRI significantly scored better for claustrophobia, noise level, positioning in the MRI, and general experience when compared with the conventional MRI (►**Table 4**). No significant differences were found in the participant experience for the duration of examination (3.8 for the extremity MRI vs. 3.3 for the conventional MRI; $p = 0.157$). Certainty of diagnostic value was considered

Table 2 Mean ± SD scores on the visibility of anatomical details, overall image quality, and artifacts on both MRI scanners

Structure	T2 STIR AX		*p*-Value	PD STIR AX		*p*-Value	PD STIR SAG		*p*-Value	PD COR		*p*-Value	PD STIR COR		*p*-Value	T2 STIR COR		*p*-Value
	1.0-T Wrist View MRI	1.5-T MRI		1.0-T Wrist View MRI	1.5-T MRI		1.0-T Wrist View MRI	1.5-T MRI		1.0-T Wrist View MRI	1.5-T MRI		1.0-T Wrist View MRI	1.5-T MRI		1.0-T Wrist View MRI	1.5-T MRI	
TFCC																		
Central disc							2.5 ± 0.6	2.6 ± 0.5	0.32	3.5 ± 0.8	3.6 ± 0.6	0.32	3.2 ± 0.7	3.0 ± 0.7	0.25	2.9 ± 0.5	2.4 ± 0.8	0.01[a]
Meniscus homolog							1.7 ± 0.5	1.8 ± 0.6	0.41	3.1 ± 0.8	3.4 ± 0.6	0.08	2.8 ± 0.8	2.9 ± 0.7	0.63	2.3 ± 0.8	2.3 ± 0.7	0.81
Ulnar attachment							1.9 ± 0.6	2.0 ± 0.5	0.18	3.1 ± 1.0	3.5 ± 0.6	0.12	3.2 ± 0.8	2.9 ± 0.7	0.17	2.6 ± 0.8	2.2 ± 0.6	0.03[a]
Carpal ligaments																		
SL ligament										3.3 ± 0.6	3.1 ± 0.6	0.26	3.0 ± 0.7	2.5 ± 0.8	0.005[a]	2.8 ± 0.9	2.4 ± 0.6	0.09
LT ligament										3.0 ± 0.8	2.8 ± 0.9	0.31	2.8 ± 0.8	2.1 ± 0.7	0.003[a]	2.6 ± 0.8	2.1 ± 0.7	0.06
Intercarpal cartilage							1.4 ± 0.6	1.6 ± 0.6	0.32	3.2 ± 0.7	3.7 ± 0.5	0.021[a]	2.3 ± 0.7	1.9 ± 0.5	0.01[a]	2.1 ± 0.7	1.7 ± 0.7	0.10
Nerves																		
N. medianus	3.4 ± 0.6	3.2 ± 0.6	0.03[a]	3.6 ± 0.5	3.2 ± 0.5	0.007[a]												
N. ulnaris	2.4 ± 0.7	2.2 ± 0.7	0.10	2.7 ± 0.6	2.3 ± 0.6	0.007[a]												
Overall i mage quality	3.7 ± 0.5	3.4 ± 0.6	0.06	3.7 ± 0.6	3.4 ± 0.6	0.033[a]	3.2 ± 0.5	3.3 ± 0.4	0.70	4.4 ± 0.7	4.7 ± 0.5	0.020[a]	3.6 ± 0.8	3.6 ± 0.6	1.000	3.7 ± 0.8	3.0 ± 0.8	0.010[a]
Artifacts	3.5 ± 0.6	3.1 ± 0.8	0.10	3.3 ± 0.7	3.0 ± 0.8	0.22	3.7 ± 0.7	4.0 ± 0.2	0.19	3.8 ± 0.4	4.0 ± 0.0	0.046[a]	3.8 ± 0.5	3.8 ± 0.4	1.000	3.9 ± 0.3	3.8 ± 0.4	0.18

Abbreviations: AX, axial; COR, coronal; LT, lunotriquetral; MRI, magnetic resonance imaging; PD, proton density; SAG, sagittal; SL, scapholunate; STIR, short tau inversion recovery; TFCC, triangular fibrocartilage complex.

Anatomical details: 1, structure was not visible; 2, a structure was visible but not able to be analyzed; 3, structure was visible and able to be analyzed; 4, structure was excellently visible, with sharp outlines.
Overall image quality: 1, low signal-to-noise ratio (SNR), trabecular structure and articular cartilage are not clear definable; 2, low-to-moderate SNR, trabecular structure *or*articular cartilage is not clearly definable; 3, moderate SNR, trabecular structure is poorly visible, articular cartilage is definable, but the two parts (proximal and distal) are not distinguishable; 4, moderate-to-high SNR, trabecular structure and the articular cartilage are well visible, but the margin between bone and cartilage or the intercartilage gap is not clearly definable; 5, high SNR, trabecular structure is excellently visible, with clear margins between the bone and cartilage, the cartilage parts are clearly definable, and the intercartilage gap is visible (with or without synovial fluid).
Artifacts: 1, severe artifacts; 2, moderate artifacts; 3, mild artifacts; 4, no artifacts.
[a]Significant values.

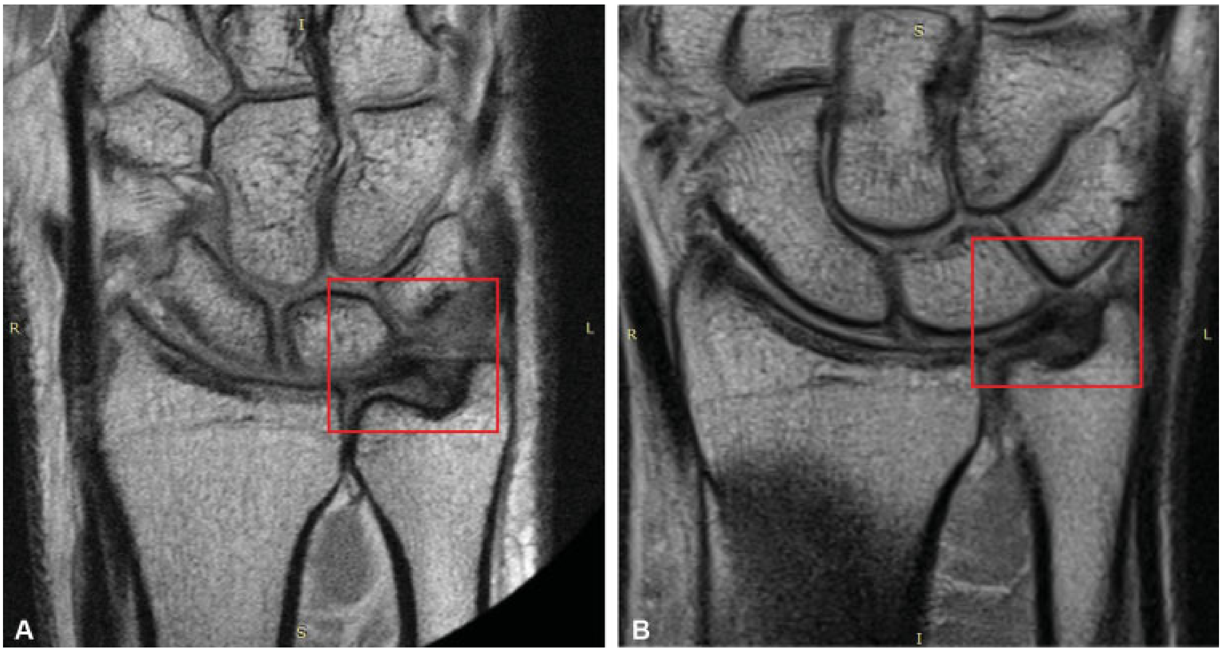

Fig. 1 Triangular fibrocartilage complex: dedicated extremity MRI (**A**) versus conventional MRI (**B**).

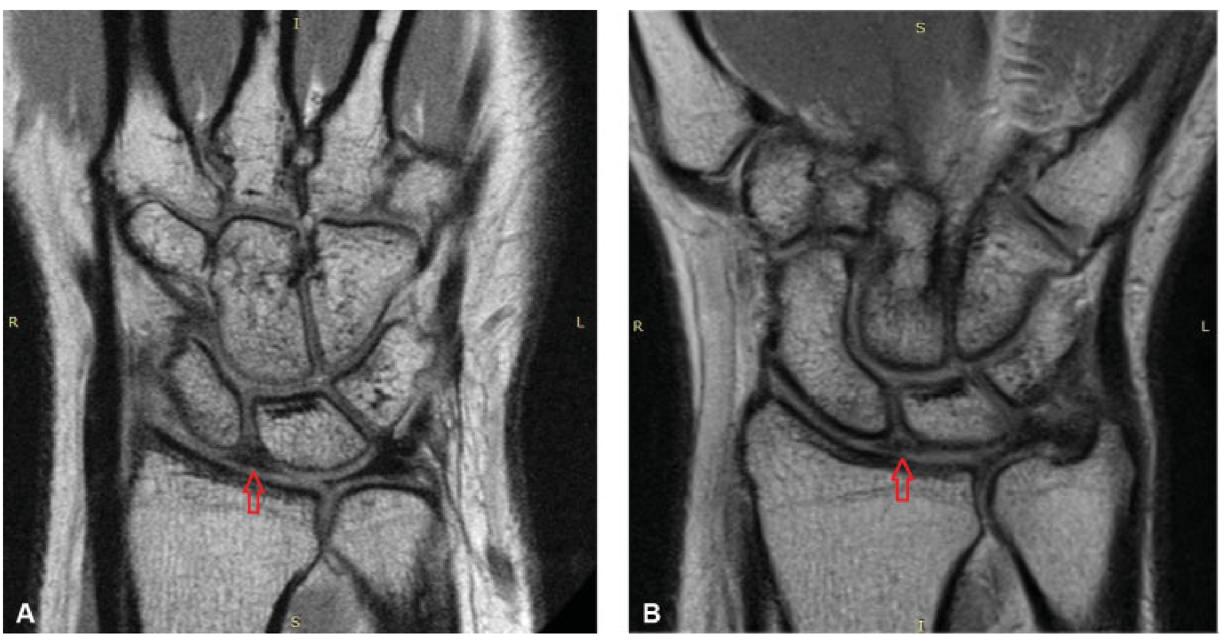

Fig. 2 Scapholunate ligament: dedicated extremity MRI (**A**) versus conventional MRI (**B**).

the most important factor for undergoing an MRI scan of the wrist or hand by the participants followed by waiting time to the first possibility of the MRI scan, positioning in the MRI, travel distance, duration of examination, costs, claustrophobia, and noise. In case the diagnostic value of both scanners would be similar, all of the respondents would choose for an examination with the dedicated extremity MRI. However, in case there is a chance that the extremity MRI provides insufficient information, resulting in another examination with a conventional MRI, seven respondents opted for the conventional MRI as a first choice. Two volunteers would still opt for the extremity MRI.

Discussion

This study compared the images of the wrist obtained with the dedicated 1.0-T WristView MRI and a conventional 1.5-T MRI in healthy volunteers using the same geometrical scan parameters and measured participant satisfaction for both systems. In the past, several dedicated low-field extremity scanners have been developed, including the 0.31-T O-scan, 0.25-T G-scan, 0.2-T Artoscan (EsaoteBiomedica), and 1.0-T OrthOne (ONI Medical Systems). The WristViewMRI was specifically developed for the hand and wrist. The system is easier accessible than the conventional MRI and requires

Fig. 3 Lunotriquetral ligament: dedicated extremity MRI (**A**) versus conventional MRI (**B**).

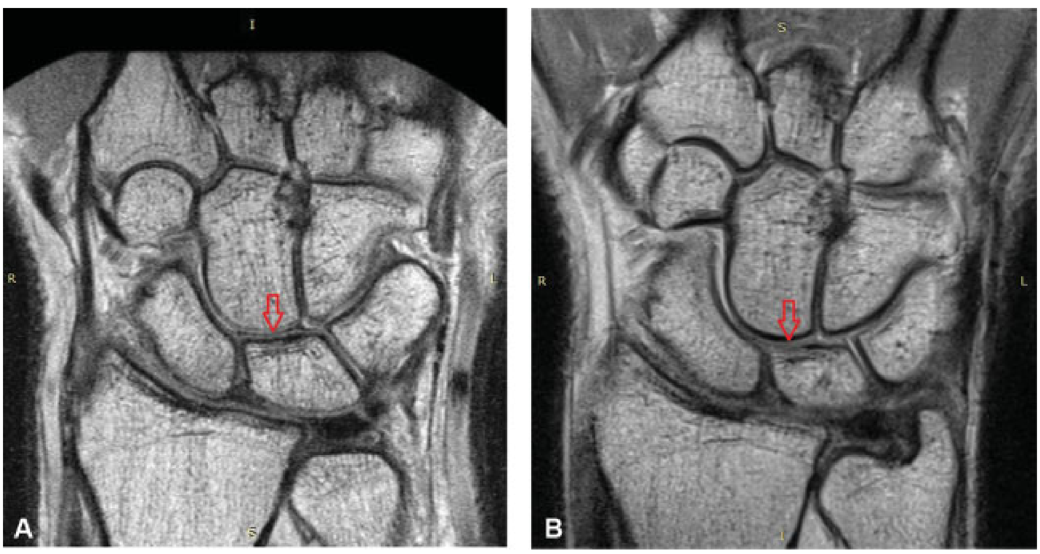

Fig. 4 Intercarpal cartilage: dedicated extremity MRI (**A**) versus conventional MRI (**B**).

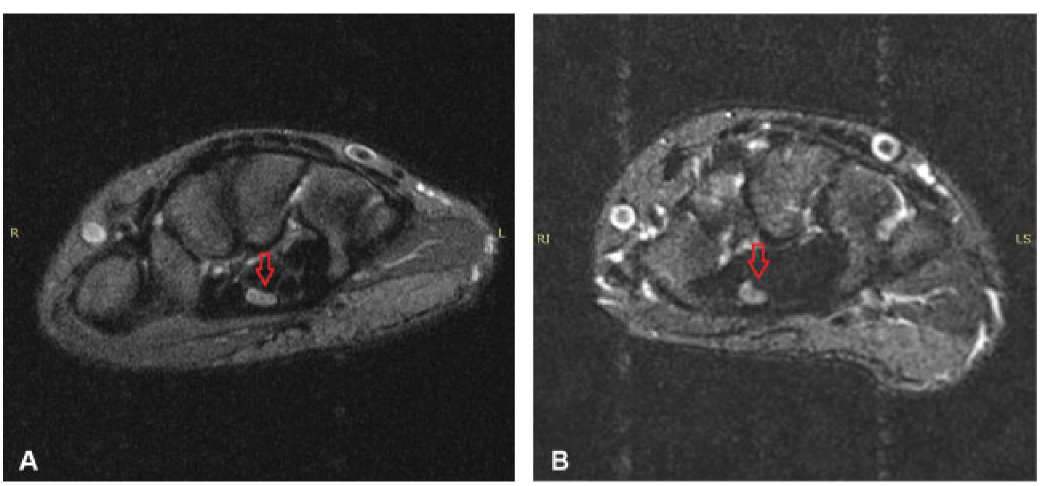

Fig. 5 Medial nerve: dedicated extremity MRI (**A**) versus conventional MRI (**B**).

Table 3 Interrateragreement (%): exact agreementand agreementwithin 1 point

Structure	T2 STIR AX		PD STIR AX		PD STIR SAG		PD COR		PD STIR COR		T2 STIR COR	
Wrist View	1.0-T Wrist View MRI	1.5-T MRI	1.0-T Wrist View MRI	1.5-T MRI	1.0-T Wrist View MRI	1.5-T MRI	1.0-T Wrist View MRI	1.5-T MRI	1.0-T Wrist View MRI	1.5-T MRI	1.0-T Wrist View MRI	1.5-T MRI
TFCC												
Central disc					33/89	30/100	67/89	30/100	56/100	40/90	67/89	20/80
Meniscus homologue					56/100	50/100	33/100	50/100	22/67	50/90	33/67	40/100
Ulnar attachment					56/89	80/100	67/67	50/100	44/89	40/90	67/89	30/90
Carpal ligaments												
SL ligament							67/100	60/100	22/89	20/70	33/78	30/90
LT ligament							33/89	30/80	44/89	40/90	22/89	40/80
Intercarpal cartilage					75/100	70/100	30/100	70/100	33/89	50/100	33/89	50/89
Nerves												
N. medianus	56/100	50/100	78/100	70/100								
N. ulnaris	44/78	60/90	67/89	50/100								
Overall image quality	50/100	10/90	30/100	30/100	30/100	50/100	78/89	30/100	56/78	60/100	22/100	30/80
Artifacts	67/100	50/100	44/78	60/90	75/88	90/100	78/100	100/100	78/89	60/100	78/100	40/90

Abbreviations: AX, axial; COR, coronal; LT, lunotriquetral; MRI, magnetic resonance imaging; PD, proton density; SAG, sagittal; SL, scapholunate; STIR, short tau inversion recovery; TFCC, triangular fibrocartilage complex.
Note: Agreement within 1 point, agreement within a range of ± 1 point.

Table 4 Mean ± SD scores of questionnaire among participants ($N = 9$)

	1.0-T Wrist View MRI	1.5-T MRI	*p*-Value
Claustrophobia	4.8 ± 0.4	3.3 ± 1.0	0.010[a]
Noise level	4.6 ± 0.5	3.1 ± 1.5	0.015[a]
Positioning in the MRI	3.7 ± 0.7	2.7 ± 0.9	0.034[a]
Duration of examination	3.8 ± 0.8	3.3 ± 0.7	0.157
General experience	4.0 ± 0.0	2.8 ± 0.7	0.010[a]

Abbreviations: MRI, magnetic resonance imaging; SD, standard deviation.
Note: 1, very bad; 5, very good.
[a]Significant values.

limited maintenance as a result of the permanent magnet, while still operating at 1.0-T. The MRI requires a standard 220V power supply, a 12 m^2 room without the need for shielding, and one person for operation. In our study, participant satisfaction was better for the dedicated extremity MRI compared with the conventional MRI, with significant better scores on claustrophobia, noise level, positioning in the MRI, and general experience. Although the scanning time of 43 minutes was longer than the examination in the conventional MRI (25 minutes), no significant difference was found in the participants' scores for duration of the examination. Certainty of diagnostics was considered to be the most important factor for undergoing an MRI scan of the wrist or hand. If the diagnostic value of both scanners would be similar, all of the respondents would choose the extremity MRI over an examination with the conventional MRI. Our results showed that in 25 of 38 images, no statistical significance was found between the scores of the two MRI scanners. Among the scores assigned to the 13 paired images that were significantly different, the majority (10) was found to be in favor of the extremity MRI, including the nerves, SL and LT ligaments, intercarpal cartilage, and TFCC. The interrater agreement within a range of ± 1 score point was 67 to 100% for the dedicated extremity MRI and 70 to 100% for the conventional MRI. However, the exact agreement between the raters was low for many observations. Other studies that compared anatomical structures of the wrist using similar scoring systems also demonstrated moderate interobserver agreements.[2,6] It may be suggested that a training session in which participating readers could evaluate several scans in consensus before evaluating the scans separately could result in enhanced uniformity of the scores.

Studies on low-field extremity scanners are scarce. There are several studies that presented good results of extremity scanners with field strengths ≤ 1.0-T in diagnostics and follow-up of rheumatoid arthritis.[7–12] Some studies even conclude that low-field MRI scanners are equivalent to high-field MRI scanners in the evaluation of rheumatoid arthritis.[7,8] Taouli et al demonstrated that 1.5-T MRI and 0.2-T dedicated extremity MRI show similar results in terms of cross-sectional grading of bone erosions, joint-space narrowing, and synovitis in the hands and wrists of patients with rheumatoid arthritis.[7] Lee et al compared the severity of wrist synovitis using the RAMRIS(Outcome Measures in Rheumatology [OMERACT] Rheumatoid Arthritis [RA] Magnetic Resonance Imaging [MRI] scoring system) grade, synovial volume,and synovial perfusion parameters between the dedicated 0.25-T G-scan and a 3-T whole-body imaging system in 21 patients. This study concluded that imaging of rheumatoid arthritis at 0.25-T yields excellent correlation with 3-T with regard to the synovitis activity score and synovial volume assessment, and fair-to-good correlation for synovial perfusion parameters.[8] Besides rheumatoid arthritis, the additional value of low-field extremity scanners in diagnosing occult fractures of the scaphoid bone and radius has been explored in the past. However, no comparison was made with a conventional MRI in those studies.[13–15] Our pilot study is unique in exploring the value of a dedicated MRI system that works with a permanent magnet and still operates at 1.0-T. In our sample population, the dedicated extremity MRI produced images with good quality and was similar or superior in depicting certain wrist structures common in wrist pathologies when compared with the conventional MRI. We did not focus on the diagnostic performance of the MRI scanner in patients with abnormalities. Future clinical studies should be performed to define the diagnostic value of the dedicated extremity MRI for different pathologies of the wrist. However, since pathology is often accompanied by edema, it is reasonable to expect that wrist abnormalities may even be easier visible compared with the normal anatomy. Limitations to our pilot study are the small sample size and the small panel of radiologists. This chosen sample size was practical for this early stage research, in which the value of the new dedicated MRI had to be explored first. The acquired data provided valuable preliminary information and is important for planning subsequent studies with larger study cohorts.

According to the data of our pilot study, the dedicated extremity MRI generally is similar or superior to the conventional MRI in the depiction of anatomical structures in wrists of healthy volunteers, image quality, and artifacts, and evidently scored better on participant satisfaction. The dedicated extremity MRI seems to be a promising alternative to the conventional MRI. With regard to the easy accessibility for both the healthcare provider and the patient, the dedicated extremity MRI scanner could be of added value in an office-based setting and possibly also in larger healthcare centers.

Conflict of Interest
R. A. M. reports that the MRI Center Amsterdam received payment to cover the costs for 10 MRI scans.

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